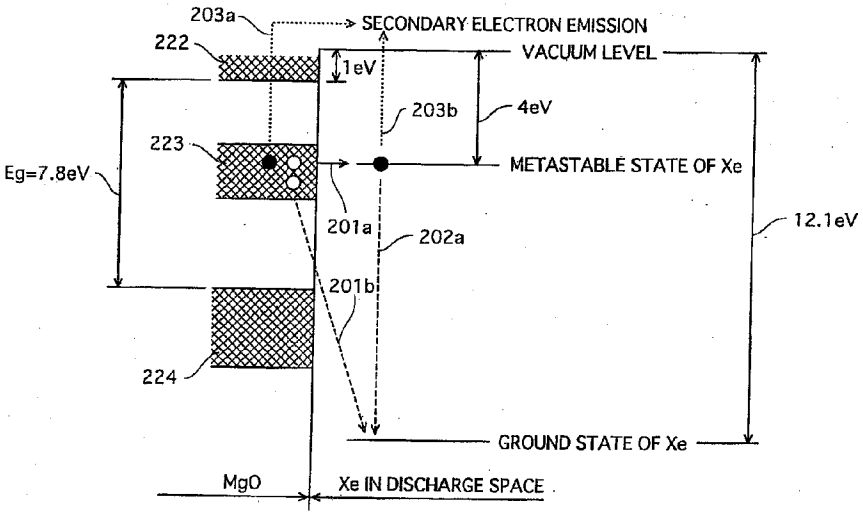
REMARKS

The present invention addresses the generation of heat in large high definitional plasma display panels, along with the cost of energy while enabling an improvement in the luminescence efficiency and the use of lower cost electronic components.

Reference can be made to our Figure 5 showing the relationship between a firing voltage in the discharge cell, and the partial pressure of a constituent gas, and also Figure 2 of our present application that discloses the result of performing a process of resonance and neutralization and Auger neutralization, to demonstrate the capability of maintaining a relatively low firing voltage in the same manner of conventional PVP, wherein the Xe partial pressure is low, while still improving the luminescence efficiency by our unique capacity of efficiently emitting secondary electrons from the surface of the protective MgO film.

FIG.2



Our present inventors have reviewed the characteristics of the conventional magnesium oxide protective layer in PDPs and found that the forbidden band of magnesium oxide usually does not contain a region of space where electrons can reside and it is those electrons in a

valence band that can contribute to secondary electron emission, which is desirable from a surface of a protective MgO film.

Thus, utilizing a discharge gas that includes Xe with a partial pressure of no less than 20% while providing a protective layer with an electron band, including at least electrons having an energy level of 4 eV or less formed within the forbidden band were able to facilitate an emission of a larger amount of secondary electrons. Since our discharge gas includes Xe, energy required for emitting a secondary electrons is readily obtained since the metastable state of Xe is located at an energy level of 4 eV below the vacuum layer. Energy of approximately 8.1 eV is emitted when one electron in the metastable state of Xe transits to the ground state of Xe, since the ground state of Xe is located at an energy level 12.1 eV below the vacuum level.

When the Ne partial pressure is decreased, Xe can contribute to the secondary electron emission from the protective layer and will not have an undesirable effect of raising the firing voltage.

The Office Action contended that since magnesium oxide is known and has certain chemical properties that ipso facto it must also have the same electrical characteristics. Reference can be made, however, to Figure 3 of our drawings which discloses that in a conventional PDP with MgO, even when an electron is present in a valence band having energy of at least 8.8 eV and transits to the ground state of Xe having an energy depth of 12.1 eV, the energy given off to another electron in the valence band is less than the amount required to jump across the energy depth of approximately 8.8 eV between the valence band and the vacuum level.

Therefore, any energy given off could either be consumed or maintained within the protective layer and would not provide the characteristics of an increased secondary electron emission.

The Office Action does not address these issues nor does it provide a justification for the contention that the "electric properties" must be the same since magnesium oxide is being utilized.

Claims 1-6 and 13-14 were held to be held obvious over a combination of *Morita et al.* (WO 2004/049375) (U.S. Patent No. 7,432,656) in view of *Kawashima* (WO 03/107391) (U.S. Patent No. 7,193,363).

As can be appreciated, only the *Morita et al.* (WO 2004/049375) publication is relied upon as the principal reference to formulate the rejection. U.S. Patent 7,432,656 is used for convenience purposes for its English translation.

A review of this PTC reference discloses that it is assigned to the same assignee of the present invention and in fact, three of the four inventors are also co-inventors of the present application.

Applicant respectfully submits that the *Morita et al.* reference is not a proper prior art reference, since it was filed on or after November 29, 2000 and was not published in English under PCT Article 21(2), but was in fact published in Japanese. See MPEP §706.02(f)(1).

Additionally, the present application is entitled to a foreign priority date from Japanese Application 2003-370382, filed on October 30, 2003.

If the Office Action contends that this patent publication (WO 2004/049375) is still in fact a prior art reference. Applicant requests that the Examiner contact the undersigned attorney, to if necessary, provide an English translation of our priority document dated October 30, 2003 to accelerate the prosecution.

Since this is a Second Office Action with a citation of new art, it is requested that the following comments be taken into consideration, since both Office Actions have relied upon a

contention that a generic chemical composition of magnesium oxide will not be altered by processing in an environment within a plasma display panel, as set forth in our current claims.

Specifically the *Morita et al.* reference was cited for its teachings in Figures 1 and 8 to teach a magnesium oxide protective layer with a dielectric layer for covering the electrodes. Use of an xenon gas was cited with the unsupported contention that if the chemical compositions of MgO were the same, then electrical properties in the protective layer would be also the same as our current claims.

The *Kawashima* reference was cited for a partial pressure of an xenon gas with the contention that it would be obvious to a person of ordinary skill in the field to maintain a partial pressure of less than 20% to allow for less temperature sensitive emission.

As noted above, the Office Action did not address our specific arguments set forth in our prior Rule 116 Amendment, including that our protective layer had a physically different electrical configuration resulting from creating a particular electron band and an energy level within a forbidden band within a PDP.

The current independent Claim 1 is as follows:

> A plasma display panel in which a protective layer covers a dielectric layer covering electrodes in discharge cells and faces a discharge space filled with a discharge gas, wherein the discharge gas includes Xe whose partial pressure is no less than 20%, and
>
> in the protective layer, an electron band including at least electrons having energy level of 4 eV or less below a vacuum level is formed within a forbidden band in electron bands.

According to Claim 1, the following advantageous effect can be realized.

The Xe partial pressure is no less than 20%. Accordingly, although the luminescence efficiency is improved, the firing voltage tends to easily increase. This is also described in the Society Information Display 2003 (SID 2003) 5.1 Invited Paper High Efficacy PDP attached to

the previous Response to the Final Office Action which would represent the expectation of a person of ordinary skill in this field upon reading that paper.

However, in a protective layer, an electron band including at least electrons having an energy level of 4 eV or less below a vacuum level (hereinafter, "4 eV electron band") can be formed within a forbidden band in the electron band. Also, since the metastable state (first excited state) of Xe is originally located at an energy level of 4 eV below the vacuum level, Xe ions and the protective layer can easily interact with each other. Accordingly, by performing a process of the 201a (resonance and neutralization) and the 201b (Auger neutralization) shown in the above Figure 2 of the present application, it is possible to efficiently emit secondary electrons from a surface of the protective film (MgO film) by altering the physical and electrical characteristic in the protective layer.

As a result, it is possible to maintain a low firing voltage in the same way as in conventional PDPs in which the Xe partial pressure is low, and still improve the luminescence efficiency at a higher Xe partial pressure.

Morita et al. discloses structure in which a material having high primary electron emission properties, such as high-purity MgO crystal and A1, is disposed on an MgO layer having a high secondary emission coefficient. According to this structure, the firing voltage is controlled by the MgO layer having the high secondary electron emission coefficient, and the variability in discharge probability is controlled by the material disposed on the MgO layer.

However, the high secondary electron emission coefficient of MgO according to *Morita et al.* means that the secondary electron emission coefficient of MgO is high with respect to an Ne ion. *Morita et al.* does not refer to, nor suggest any, secondary electron emission coefficient of MgO with respect to an Xe ion.

The data 2B in Figure 7 of *Morita et al.* shows photoelectron spectroscopy data with respect to a conventional protective layer formed from an MgO film; that is, a protective layer formed from an MgO film that does not include a material having high primary electron emission properties. See Column 11, Line 67. As evident from this data, the energy necessary for electron emission is 5.0 eV.

Accordingly, it is likely that any oxygen defect in the MgO layer is mainly in a state of F^+ center or a state of F^{2+} center rather than our disclosure, as shown in our Figure 2 (above).

Therefore, *Morita et al.* differs in the novel physical and electrical characteristics of an MgO layer of the present invention, and cannot realize sufficient secondary electron emission with respect to Xe ions.

According to the present invention, the energy necessary for electron emission is 4 eV or less, to exhibit an effect that the secondary electron emission properties are high even in an atmosphere rich in Xe. This is because the MgO layer is formed such that oxygen defect is in a state of F^+ center in the MgO layer. Also, it is also possible to exhibit the above effect by adding adequate impurities to MgO, instead of by forming an oxygen defect in a state of F center, as disclosed in the present invention.

Therefore, the MgO layer of *Morita et al.* does not exhibit high secondary electron emission properties with respect to Xe ion, regardless of whether a material having high primary electron emission properties is disposed on the surface of the MgO layer.

Compared with this, the MgO layer of the present invention exhibits high secondary electron emission properties with respect to Xe ions.

Furthermore, an electron band of 4.2 eV shown in Figure 8 of *Morita et al.* is obtained by disposing isolated Al members on the surface of the MgO layer.

Accordingly, electron emission at 4.2 eV is caused by the work function of the Al members and, therefore, although an electron band higher than 4.2 eV may be formed due to an influence of the surface oxidization of the Al members, an electron band lower than 4.2 eV can not be formed.

Therefore, according to *Morita et al.*, an electron emission above 4.2 eV is observed, but electron emission at an energy level of 4.2 eV or less is not observed.

According to the present invention, energy necessary for electron emission is 4 eV or below, and therefore differs in a novel structure from that of *Morita et al.* to provide new electrical properties in the environment of a PDP.

As described above, Claim 1 of the present invention differs from *Morita et al.* in an electronic state of oxygen defect in the protective layer. Accordingly, *Morita et al.* cannot exhibit an effect, like Claim 1, where it is possible to keep a firing voltage low in the same manner as in a conventional PDPs even under a condition where the partial pressure of Xe is set to no less than 20%.

Kawashima discloses a structure in which two pairs of electrodes and two types of fluorescent materials are disposed in a single discharge cell, and a discharge position is changed by switching a pair of electrodes to be discharged, in order to realize multicolor light emission using a single discharge cell.

However, *Kawashima* fails to disclose the structure which is disclosed in Claim 1, that is, a structure in which, in the protective layer, an electron band including at least electrons having energy level of 4 eV or less below a vacuum level is formed within a forbidden band in electron bands.

In other words, *Kawashima* is cited only for referring to that the discharge gas includes Xe whose partial pressure is no less than 20%.

As described, *Morita et al.* and *Kawashima* fail to recognize or address the problem that the firing voltage increases under a condition where the partial pressure of Xe is set to no less than 20%. Accordingly, *Morita et al.* and *Kawashima* fail to disclose a structure in which an energy level of an electron band that is formed within a forbidden band in electron bands of a protective layer is set to an energy level of 4 eV or less such that Xe ions and the protective layer easily interact with each other.

Therefore, even if these two references were combined with each other, it is difficult to conceive of the structure according to Claim 1 in which an energy level of an electron band that is formed within a forbidden band in electron bands of a protective layer is set to an energy level of 4 eV such that Xe ions and the protective layer easily interact with each other. Therefore, the invention according to Claim 1 involves novelty and unobviousness over the combination of *Morita et al.* and *Kawashima*.

> While "the discovery of an optimum value of a variable in a known process is normally obvious," *In re Antonie*, 559 F.2d 618, 620 (CCPA 1977), this is not always the case. One exception to the rule is where the parameter optimized was not recognized in the prior art as one that would affect the results. *Id.*
>
> Here, the Examiner has not pointed to any teaching in the cited references, or provided any explanation based on scientific reasoning, that would support the conclusion that those skilled in the art would have considered it obvious to "optimize" the prior art compositions by increasing their viscosity to the level recited in the claims.
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> *Ex parte* Whalen et al., Appeal 2007-4423, slip op. at 14 (B.P.A.I. July 23, 2008)

The Office Action rejected Claims 4, 5, 13 and 14 as being obvious over a combination of the *Morita et al.* when taken in view of the *Kawashima* reference and further, the *Akiyama et al.* (Japanese Laid-Open Patent 2003-272533).

The Office Action cited the *Akiyama et al.* reference for the purported teaching of adding either Ge or Sn to reduce a starting voltage in a display. The Office Action acknowledged that neither *Morita et al.* nor *Kawashima* addressed this issue, and presumably, the Examiner would also acknowledge that the *Akiyama et al.* reference does not address the deficiencies pointed out with regards to improved electrical properties in our protective layer for a PDP.

> The U.S. Supreme Court recently held that rigid and mandatory application of the "teaching-suggestion-motivation," or TSM, test is incompatible with its precedents. *KSR Int'l Co. v. Teleflex Inc.,* 127 S.Ct. 1727, 1741 (2007). The Court did not, however, discard the TSM test completely; it noted that its precedents show that an invention "composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *Id.*
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> *Ex parte* Whalen et al., Appeal 2007-4423, slip op. at 15 (B.P.A.I. July 23, 2008)

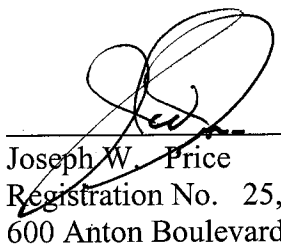
It is believed that the present application is now in condition for allowance and if there is any issue with regards to the prior art status of *Morita et al.* (WO 2004/049375), the undersigned attorney would appreciate a telephone conference in order to expedite a resolution of this issue.

It is submitted that the present application is in condition for allowance.

Needless to say, the undersigned attorney is available if the Examiner believes that a telephone conference on any issue in this case would assist in the prosecution.

Very truly yours,

SNELL & WILMER L.L.P.



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